

# Lightning During Crystal Face

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# Introduction

- Information on cloud-to-ground (CG) lightning activity during CRYSTAL-FACE was provided by the National Lightning Detection Work.
- For the duration of the field project, data files for the previous day were downloaded from NASA MSFC, and analyzed at the University of Maryland.
- For WB57 flight days, flashes were counted in  $0.25^\circ$  latitude by  $0.25^\circ$  longitude bins over the south Florida area and hourly plots generated to send to the field.

## **Introduction (continued)**

- Following the completion of the field project, further analysis was completed.
- Plots with increased temporal resolution were generated for several cases of interest.
- Using plots of lightning activity in addition to satellite and radar imagery, CG lightning totals for the primary storms sampled by the WB57 were estimated.
- Data from the Los Alamos Sferic Array (LASA) which has 5 stations in Florida were obtained. The LASA provides data for both intracloud (IC) and CG flashes.

## **Introduction (continued)**

- Hourly plots were generated for specific days of interest to estimate NO production by lightning (see poster by B. Ridley et al.).
- Plots of lightning totals for particular storms were also generated.
- Lightning totals over 10-minute intervals were plotted to compare with particular NO spikes recorded by the WB57.
- Several examples are shown below.

## **Future Research**

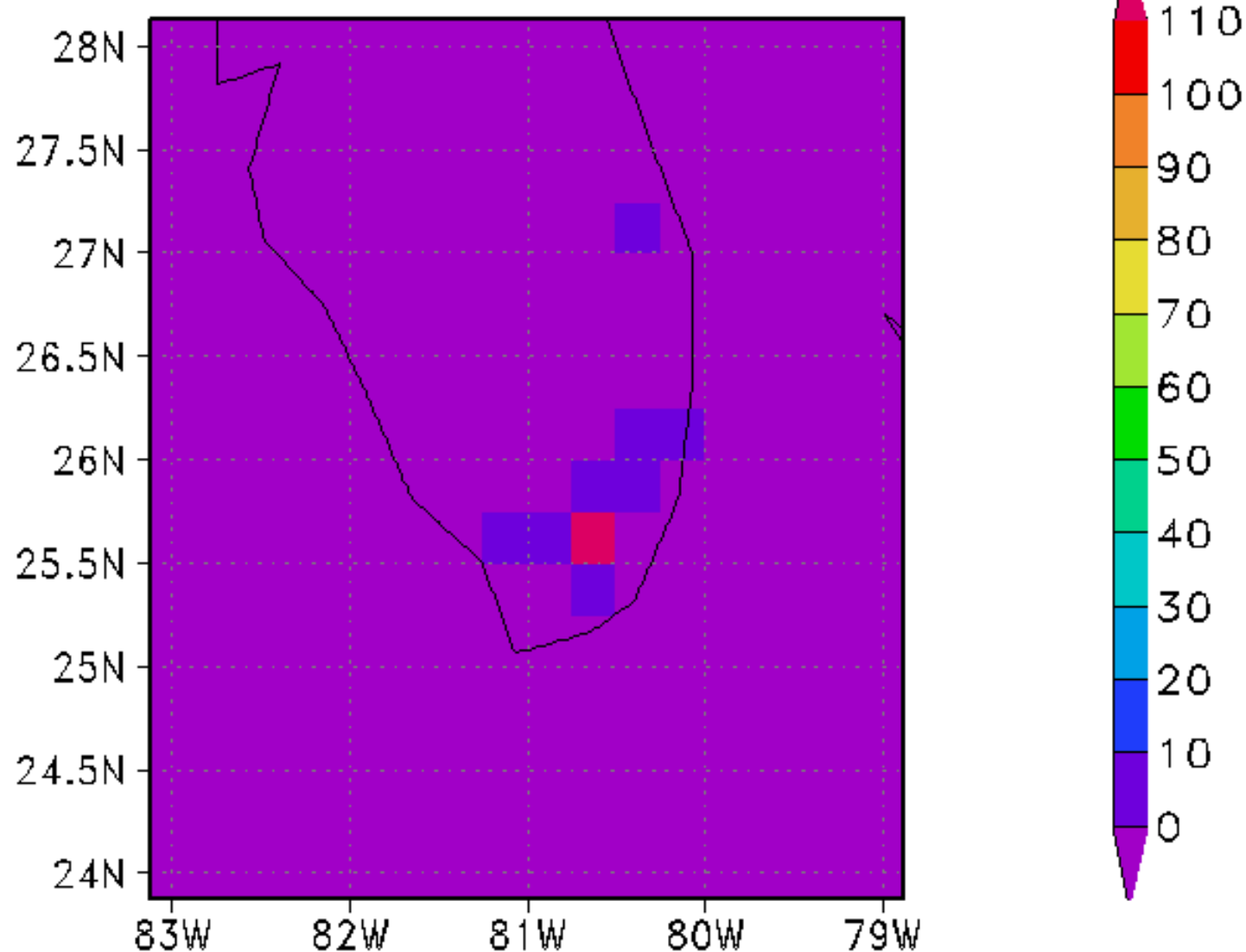
- The detection efficiency of the LASA for both CG and IC flashes is currently unknown, though it is being examined at Los Alamos.
- With a knowledge of the detection efficiencies, these data will be used with the NLDN data to deduce the time evolution of the IC/CG ratio for storms studied during CRYSTAL-FACE.
- Approximate times series of IC and CG flash rates will be used along with specified NO production rates in the University of Maryland's Cloud Scale Chemical Transport Model (CSCTM).

## **Future Research (continued)**

- Through comparison of model results with observations of NO taken in storm anvils, the most likely production of NO per flash will be estimated.
- The relationship between total water transport during convection and flash rates will be studied for selected cases using cloud model simulations.
- A possible relationship between aerosols and lightning will also be studied using aerosol data obtained from the Twin Otter.

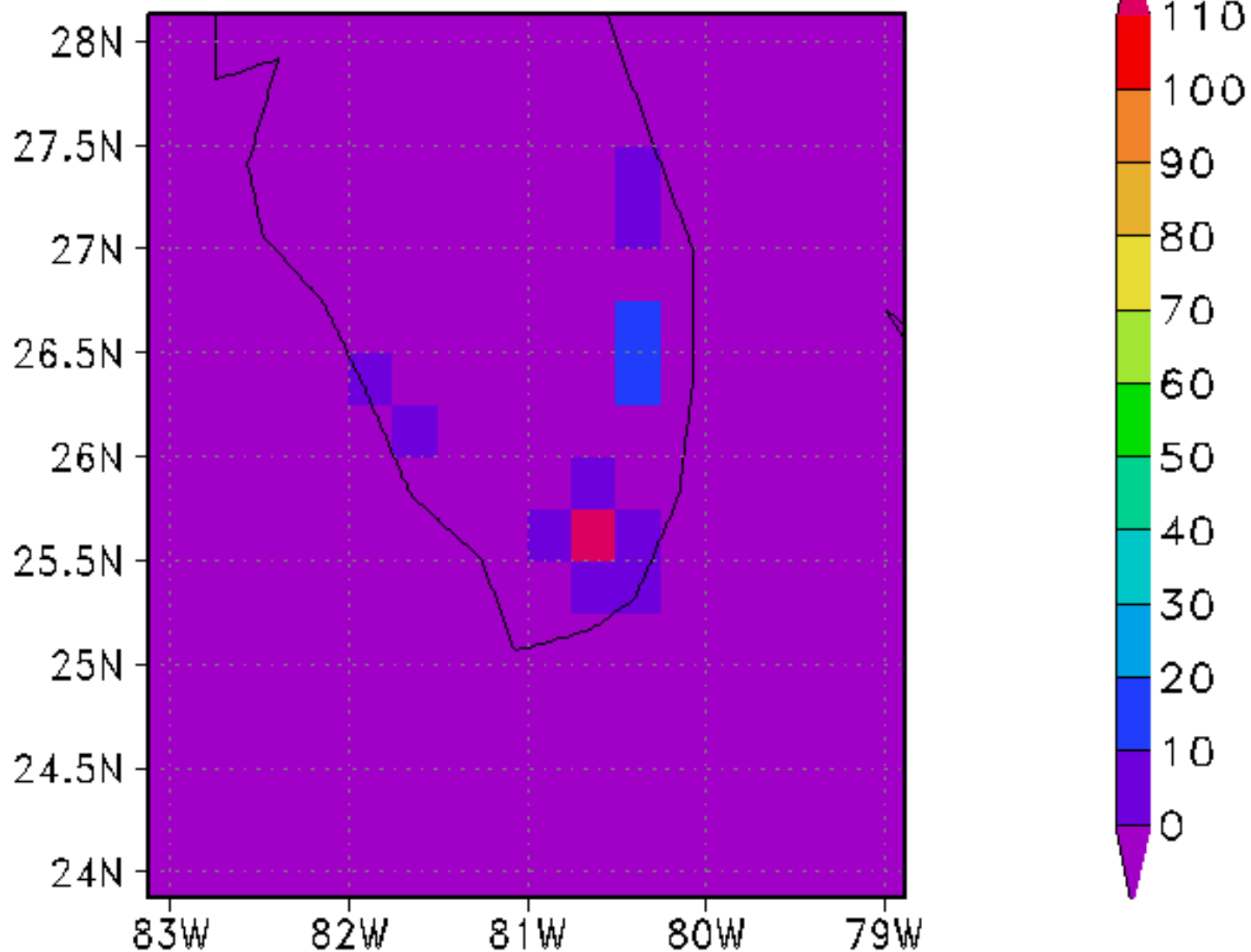
NLDN Lightning:02/07/16/19-20 UTC

(flashes per 0.25 deg. lat. by 0.25 deg. lon.)



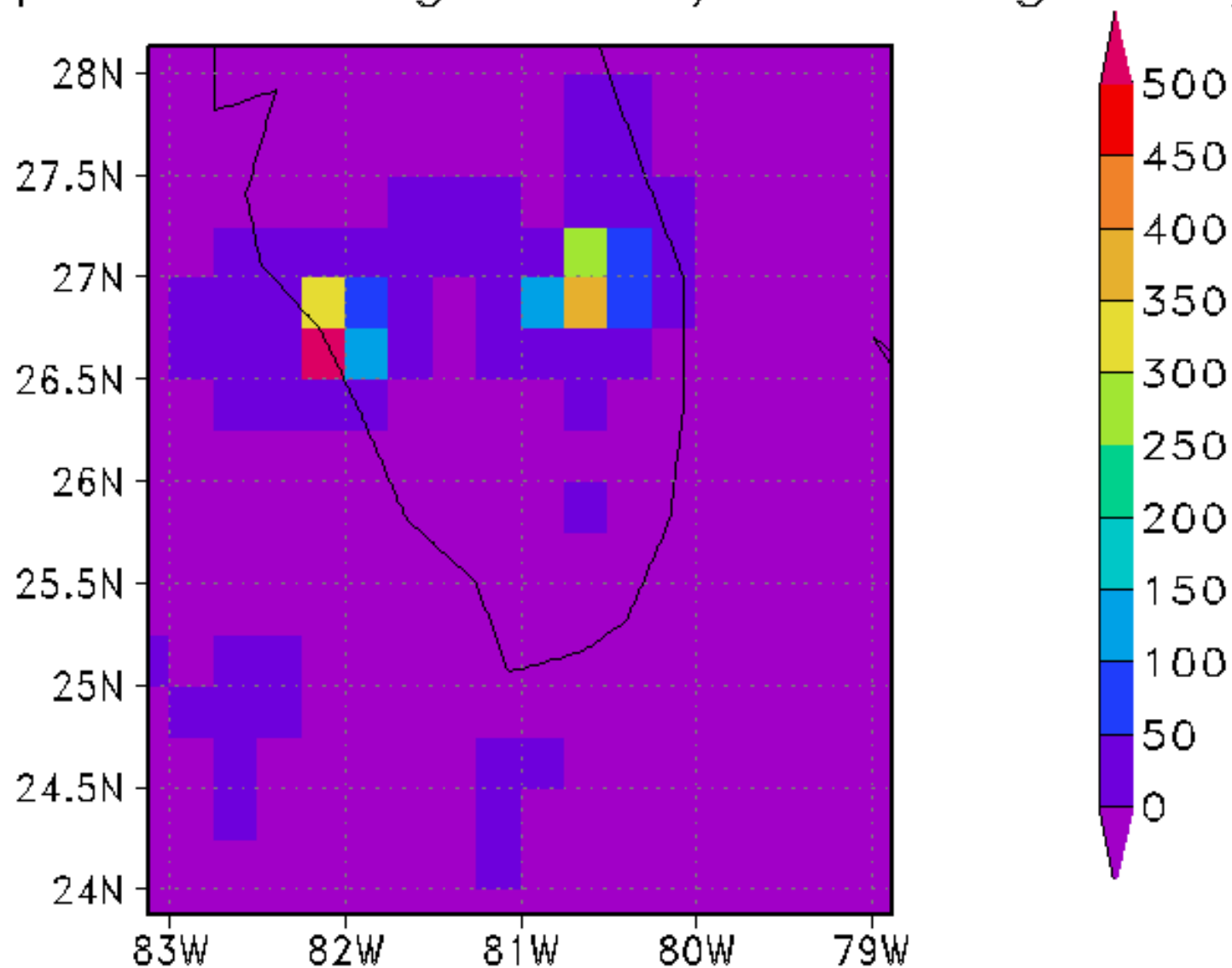
NLDN Lightning:02/07/16/20-21 UTC

(flashes per 0.25 deg. lat. by 0.25 deg. lon.)

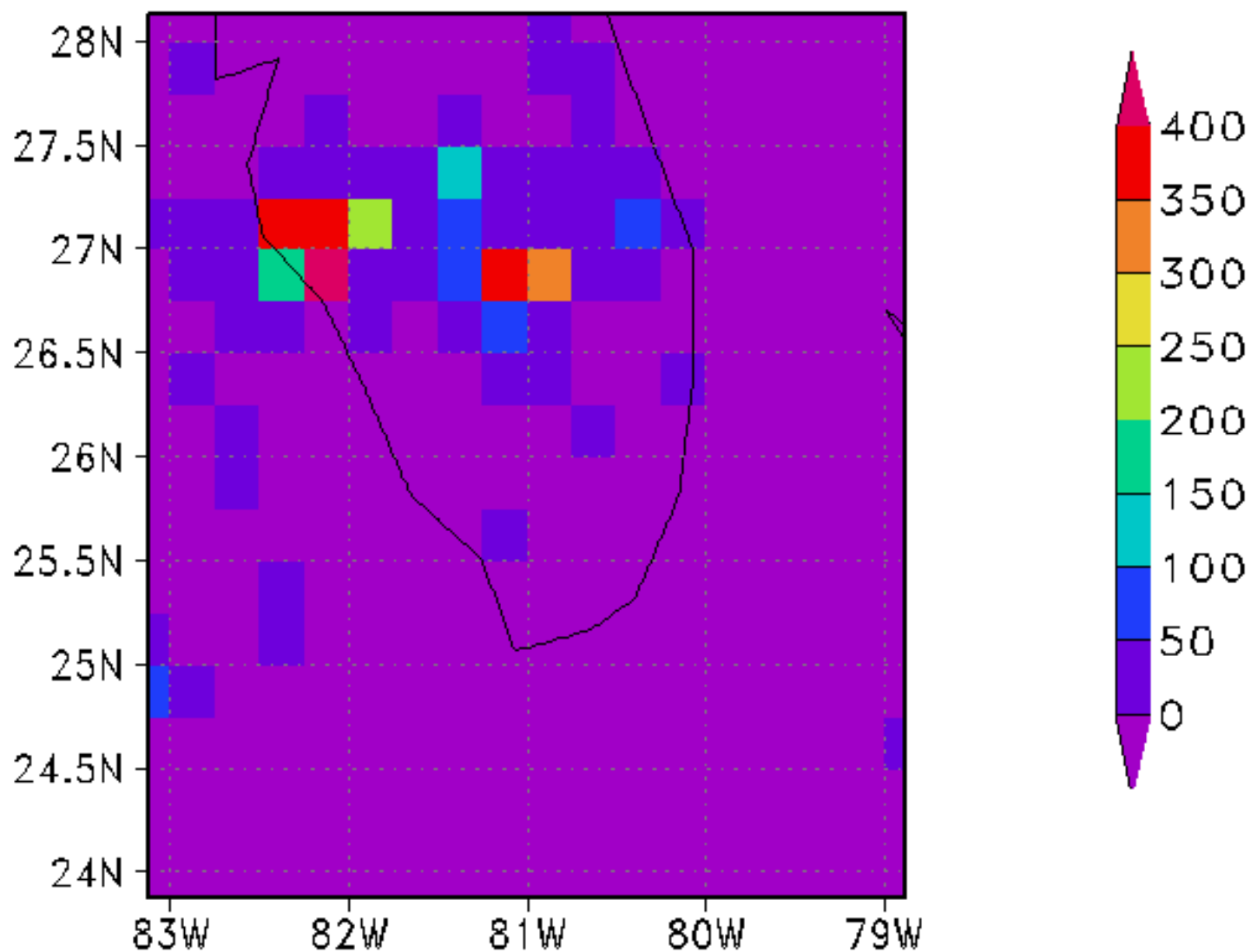




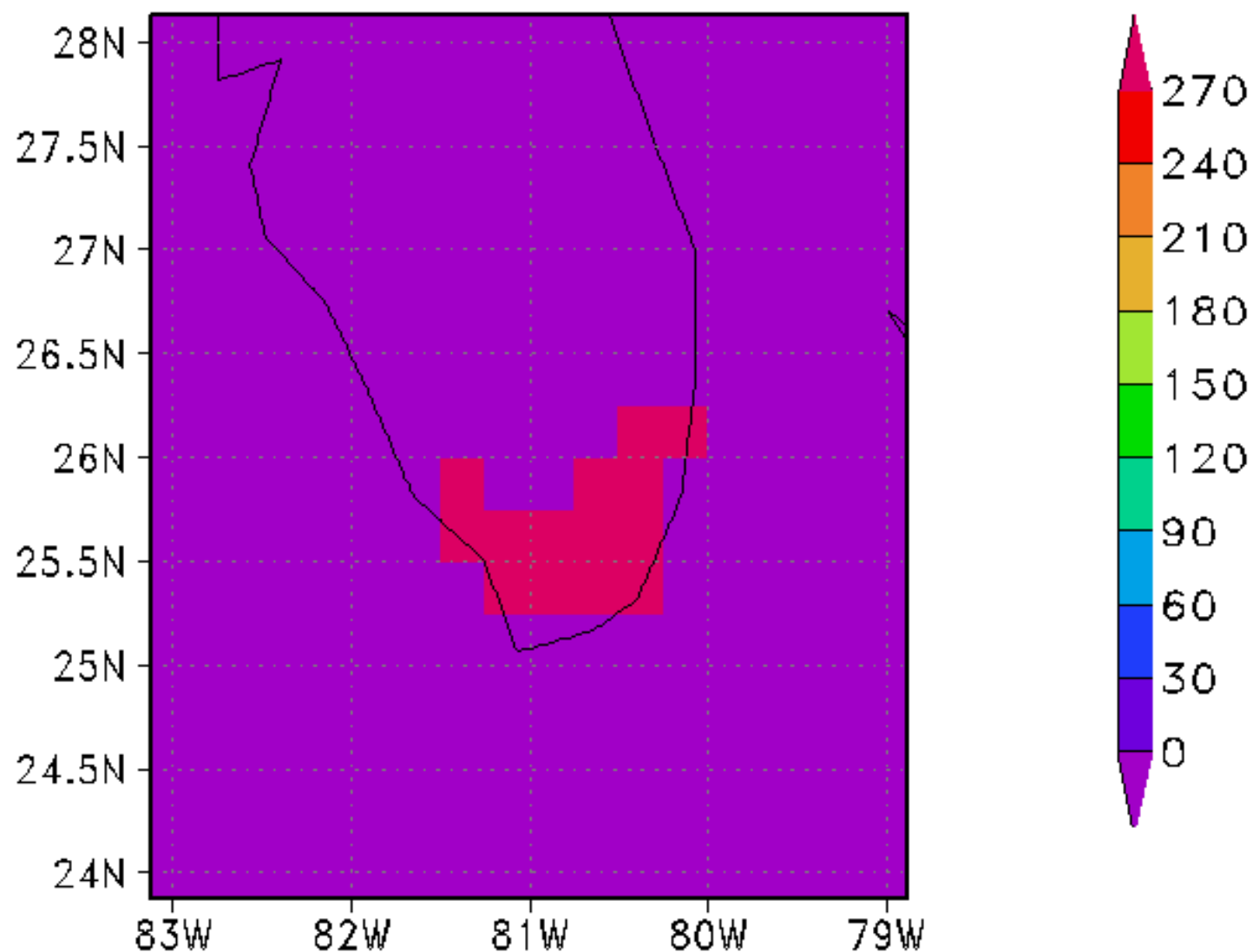
NLDN Lightning:02/07/29/18-19 UTC  
(flashes per 0.25 deg. lat. by 0.25 deg. lon.)



NLDN Lightning:02/07/29/19-20 UTC  
(flashes per 0.25 deg. lat. by 0.25 deg. lon.)

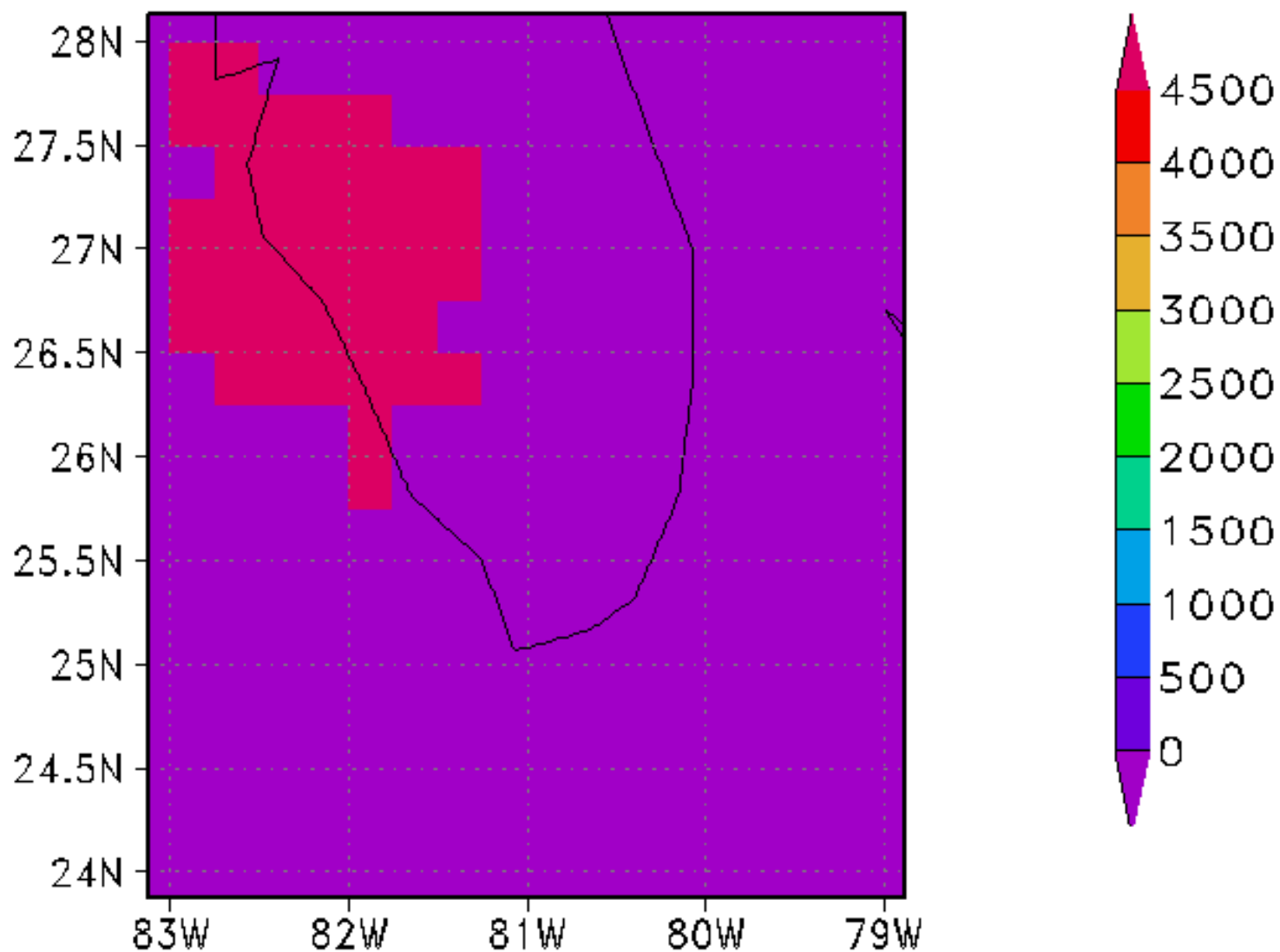


NLDN Lightning:02/07/16/19-24 UTC  
(flashes per 0.25 deg. lat. by 0.25 deg. lon.)



NLDN Lightning:02/07/29/16-21 UTC

(flashes per 0.25 deg. lat. by 0.25 deg. lon.)



WB-57 FLIGHT TRACK  
JUL 16, 2002

TIME (GMT)

18: 08-18: 59

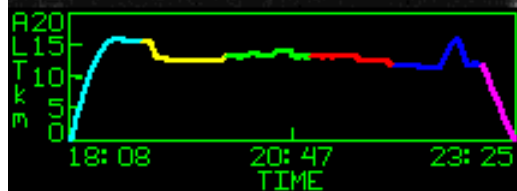
19: 00-19: 59

20: 00-20: 59

21: 00-21: 59

22: 00-22: 59

23: 00-23: 24



2

GOES-8 VIS

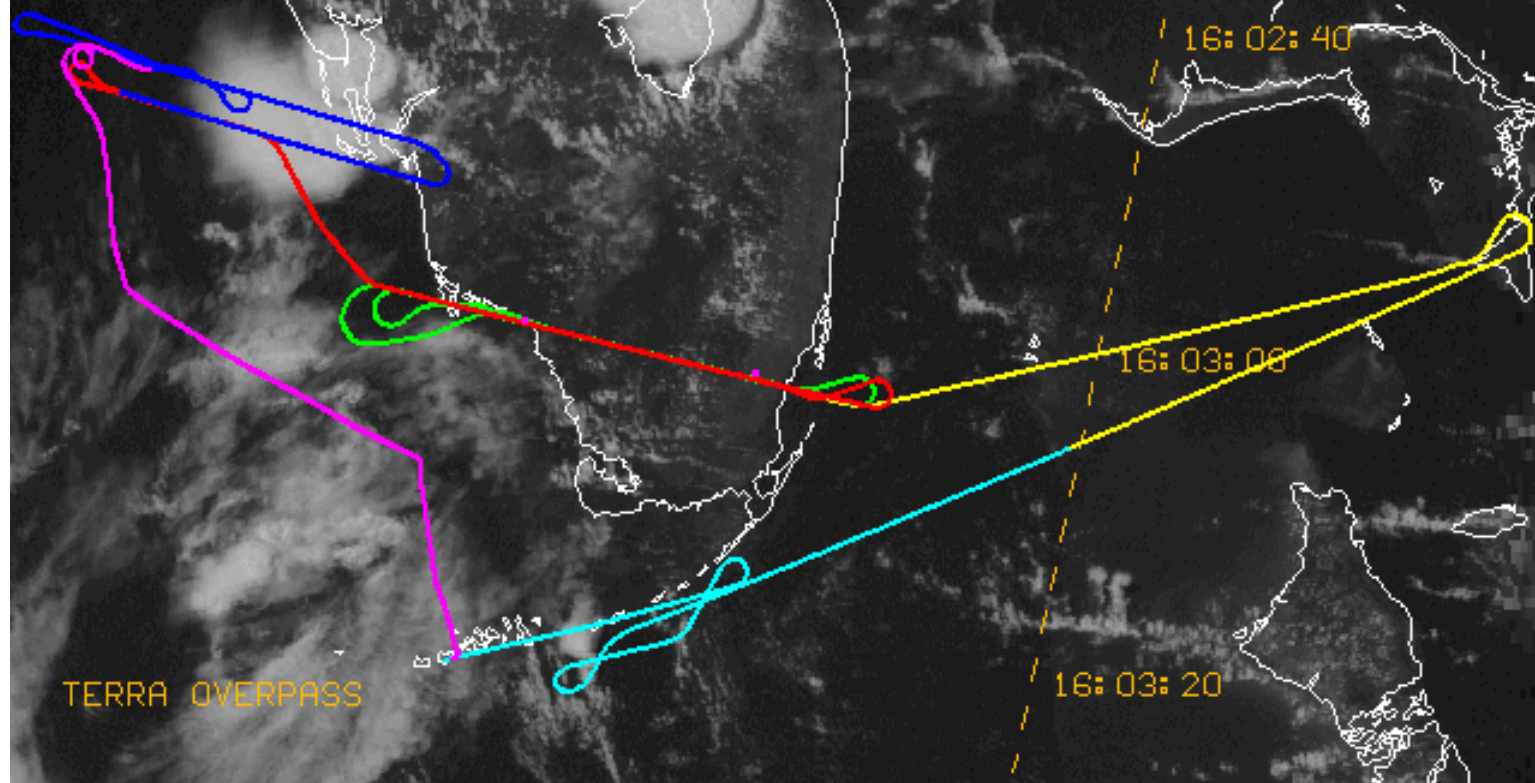
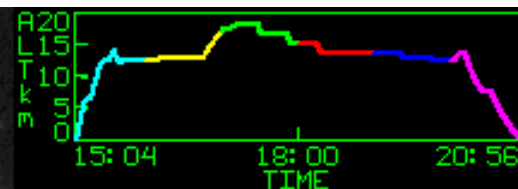
16 JUL 02 20:45 Z

NASA LARC

•W/E SITES

# WB-57 FLIGHT TRACK JUL 29, 2002

TIME (GMT)  
15: 04-15: 59  
16: 00-16: 59  
17: 00-17: 59  
18: 00-18: 59  
19: 00-19: 59  
20: 00-20: 55



WB-57 FLIGHT TRACK  
JUL 07, 2002

TIME (GMT)  
20: 06-20: 06  
20: 07-20: 07  
20: 08-20: 08  
20: 09-20: 09  
20: 10-20: 10  
20: 11-20: 11



2

GOES-8 VIS

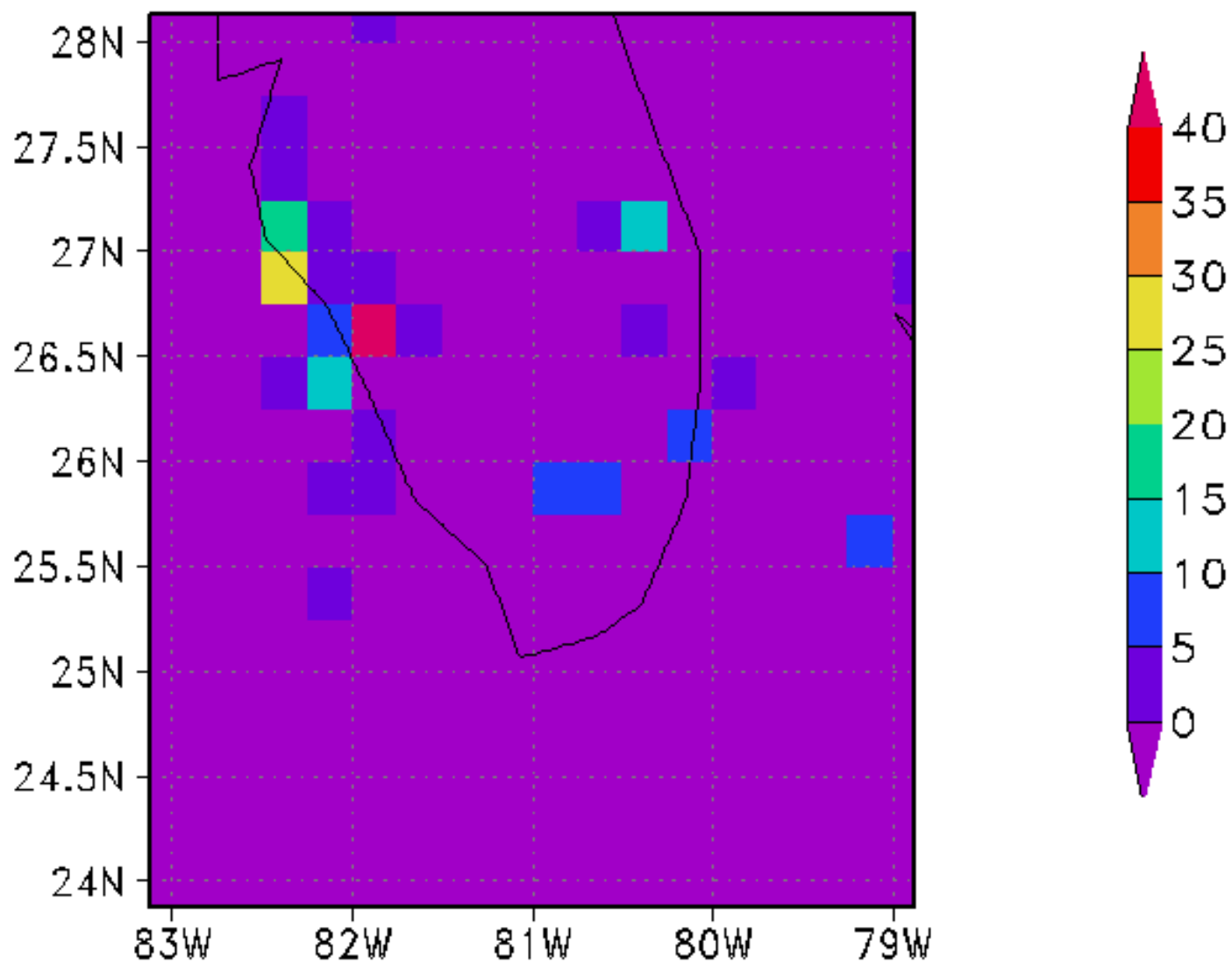
7 JUL 02 20:10 Z

NASA LARC

•W/E SITES



NLDN Lightning:02/07/07/2000–2010 UTC  
ashes per 0.25 deg. lat. by 0.25 deg. lon.)





NY20020707.WB57

